IN THE CLAIMS:

1. (Original) A heat pump system including:

a primary compressor;

a booster compressor;

a refrigerant conduit system, said primary compressor and said booster compressor being in series in said refrigerant conduit system;

a control panel, said control panel being connected between a multi-step thermostat and said primary and booster compressors, said control panel receiving signals from the multi-step thermostat and delivering power to operate said primary compressor and said booster compressor in a predetermined sequence in response to steps of the thermostat; and

at least one pressure sensor connected to said refrigerant conduit system for sensing refrigerant pressure at approximately the refrigerant low pressure side to generate signals to prevent or permit operation of said primary compressor or said booster compressor as a function of outdoor ambient temperature.

2. (Original) A heat pump system as in claim 1 wherein:

said pressure sensor senses the pressure in said refrigerant conduit system at a location upstream of the inlets to each of said primary compressor and said booster compressor.

3. (Original) A heat pump system as in claim 1 including:

a microprocessor for receiving signals from said pressure sensor to control operation of said primary compressor or said booster compressor as a function of outdoor ambient temperature.

4. (Original) A heat pump system as in claim 3 wherein the control of said primary compressor or said booster compressor is selected from the group comprising:

a) prevent operation of said booster compressor when refrigerant system low side pressure is higher than a first predetermined level;

b) prevent operation of back-up heat when the refrigerant system low side pressure is higher than a second predetermined level;

c) heat pump system safety shutdown when refrigerant system low side pressure is below a predetermined level.

5. (Original) A heat pump system as in claim 1 wherein:

said primary compressor is a multi-capacity compressor.

6. (Original) A heat pump system as in claim 5 wherein:

said primary compressor is an unloadable compressor or multi-speed compressor.

7. (Original) A heat pump system as in claim 5 including:

at least two pressure sensors connected to said refrigerant conduit system to sense refrigerant pressure at approximately the refrigerant system low pressure side, one of said pressure sensors being connected to prevent or permit operation of said primary compressor, and another of said pressure sensors being connected to prevent or permit operation of said booster compressor.

8. (Original) A heat pump system as in claim 5 including:

at least three pressure sensors connected to said refrigerant conduit system to sense refrigerant pressure at approximately the refrigerant system low pressure side to control operation of said primary compressor and said booster compressor from the control group comprising:

a) permit operation of said booster compressor when refrigerant system low side pressure falls to a first predetermined level;

b) permit operation of back-up heat when refrigerant system low side pressure falls to a second predetermined level;

c) prevent operation of said primary compressor when refrigerant system low side pressure falls to a third predetermined level when operating in the cooling mode;

d) prevent operation of said primary compressor and said booster compressor when refrigerant system low side pressure falls to a fourth predetermined level when operating in the heating mode;

e) cause full capacity operation of said primary compressor when outside ambient air temperature is too cold for safe partial operation of said primary compressor.

9. (Original) A heat pump system as in claim 1 including:

a heat exchanger in heat exchange relationship with a section of said refrigerant conduit system when the heat pump system is operating in a defrost mode;

a defrost energy transfer fluid supply for delivering defrost energy transfer fluid to said heat exchanger to supply energy to the refrigerant in said section for defrost operation of the heat pump system.

10. (Original) A heat pump system including:

a multi-capacity primary compressor;

a booster compressor;

a refrigerant conduit system, said primary compressor and said booster compressor being in series in said refrigerant conduit system;

a source of backup heat in said heat pump system:

a control panel, said control panel being connected between a multi-step thermostat and said primary and booster compressors, said control panel receiving signals from the multi-step thermostat and delivering power to operate said primary compressor and said booster compressor in a predetermined sequence in response to steps of the thermostat; and

at least one pressure sensor connected to said refrigerant conduit system for sensing refrigerant pressure at approximately the refrigerant low pressure side to generate signals to prevent or permit operation of said primary compressor, said booster compressor, and said backup heat as a function of outdoor ambient temperature.

11. (Original) A heat pump system as in claim 10 wherein the signals from said at least one pressure sensor are effective to:

a) permit operation of said booster compressor when refrigerant system low side pressure falls to a first predetermined level;

b) permit operation of back-up heat when refrigerant system low side pressure falls to a second predetermined level;

c) prevent operation of said primary compressor when refrigerant system low side pressure falls to a third predetermined level when operating in the cooling mode;

d) prevent operation of said primary compressor and said booster compressor when refrigerant system low side pressure falls to a fourth predetermined level when operating in the heating mode;

e) cause full capacity operation of said primary compressor when outside ambient air temperature is too cold for safe partial operation of said primary compressor.

12. (Original) A heat pump system as in claim 11 including:

an economizer in said refrigerant conduit system;

and wherein signals from said at least one pressure sensor are effective to permit operation of said economizer when refrigerant system low side pressure falls to a predetermined level.

13. (Original) A heat pump system including:

a multi-capacity primary compressor;

a booster compressor;

a refrigerant conduit system, said primary compressor and said booster compressor being in series in said refrigerant conduit system;

a source of backup heat in said heat pump system:

a control panel, said control panel being connected between a multi-step thermostat and said primary and booster compressors, said control panel receiving signals from the multi-step thermostat and delivering power to operate said primary compressor and said booster compressor in a predetermined sequence in response to steps of the thermostat; and

a plurality of pressure sensors connected to said refrigerant conduit system for sensing refrigerant pressure at approximately the refrigerant low pressure side to generate signals to prevent or permit operation of said primary compressor, said booster compressor, said economizer, and said backup heat as a function of outdoor ambient temperature.

14. (Original) A heat pump system as in claim 10 wherein the signals from said plurality of pressure sensors are effective to:

a) permit operation of said booster compressor when refrigerant system low side pressure falls to a first predetermined level;

b) permit operation of back-up heat when refrigerant system low side pressure falls to a second predetermined level;

c) prevent operation of said primary compressor when refrigerant system low side pressure falls to a third predetermined level when operating in the cooling mode;

d) prevent operation of said primary compressor and said booster compressor when refrigerant system low side pressure falls to a fourth predetermined level when operating in the heating mode;

e) cause full capacity operation of said primary compressor when outside ambient air temperature is too cold for safe partial operation of said primary compressor.

15. (Original) A heat pump system as in claim 14 including:

an economizer in said refrigerant conduit system;

and wherein signals from said plurality of pressure sensors are effective to permit operation of said economizer when refrigerant system low side pressure falls to a predetermined level.

16. (Original) A method of operating a heat pump system having a primary compressor, a booster compressor, and a multi-step thermostat, including the steps of:

a) permitting operation of said primary compressor when called for by a first step of said thermostat;

b) permitting operation of said booster compressor when called for by a second step of said thermostat;

c) sensing refrigerant pressure at approximately the refrigerant system low side pressure, said pressure being commensurate with outdoor ambient air temperature;

d) preventing operation of said booster compressor, even if called for by the thermostat, when refrigerant system low side pressure is higher than a predetermined level; and

e) preventing operation of said booster compressor and said primary compressor, even if called for by the thermostat, when refrigerant system low side pressure is lower than a predetermined level.

17. (Original) A method of operating a heat pump system as in claim 16 in defrost mode, including the step of;

supplying water in heat exchange relationship with the refrigerant of the heat pump system to impart energy to the refrigerant for a defrost cycle.

18. (Original) A method of operating a heat pump system as in claim 16, wherein said heat pump system includes a source of backup heat, and including the steps of;

permitting operation of the source of backup heat when called for by a third step of said thermostat and when refrigerant system low side pressure is below a predetermined level.

19. (Original) A method of operating a heat pump system having a multi-capacity primary compressor, a booster compressor, and a multi-step thermostat, including the steps of:

a) permitting partial capacity operation of said primary compressor when called for by a first step of said thermostat;

b) permitting full capacity operation of said primary compressor when called for by a second step of said thermostat;

c) permitting operation of said booster compressor when called for by a third step of said thermostat;

d) sensing refrigerant pressure at approximately the refrigerant system low side pressure, said pressure being commensurate with outdoor ambient air temperature;

e) preventing partial capacity operation of said primary compressor, even if called for by said thermostat, and requiring full capacity operation of said primary compressor when outdoor ambient temperature is too cold for safe partial capacity operation of said primary compressor

f) preventing operation of said booster compressor, even if called for by the thermostat, when refrigerant system low side pressure is higher than a predetermined level; and

g) preventing operation of said booster compressor and said primary compressor, even if called for by the thermostat, when refrigerant system low side pressure is lower than a predetermined level.

20. (Original) A method of operating a heat pump system having a multi-capacity primary compressor, a booster compressor, an economizer, and a multi-step thermostat, including the steps of:

a) permitting full capacity operation of said primary compressor when called for by a first step of said thermostat;

b) permitting operation of said booster compressor when called for by a second step of said thermostat;

c) permitting operation of said economizer when called for by a third step of said thermostat;

d) sensing refrigerant pressure at approximately the refrigerant system low side pressure, said pressure being commensurate with outdoor ambient air temperature;

e) preventing operation of said booster compressor, even if called for by the thermostat, when refrigerant system low side pressure is higher than a predetermined level;

f) preventing operation of said economizer when refrigerant system low side pressure is higher than a predetermined level; and

g) preventing operation of said booster compressor and said primary compressor, even if called for by the thermostat, when refrigerant system low side pressure is lower than a predetermined level.

21. (Original) A method of operating a heat pump system having a multi-capacity primary compressor, a booster compressor, an economizer, a source of backup heat, and a multi-step thermostat, including the steps of:

a) permitting full capacity operation of said primary compressor when called for by a first step of said thermostat;

b) permitting operation of said booster compressor and said economizer when called for by a second step of said thermostat;

c) permitting operation of said source of backup heat when called for by a third step of said thermostat;

d) sensing refrigerant pressure at approximately the refrigerant system low side pressure, said pressure being commensurate with outdoor ambient air temperature;

e) preventing operation of said booster compressor, even if called for by the thermostat, when refrigerant system low side pressure is higher than a predetermined level;

f) preventing operation of said economizer when refrigerant system low side pressure is higher than a predetermined level;

g) preventing operation of said source of backup heat when refrigerant low side pressure is higher than a predetermined level; and

h) preventing operation of said booster compressor and said primary compressor, even if called for by the thermostat, when refrigerant system low side pressure is lower than a predetermined level.

22. (Original) A heat pump system operating in the cooling mode, said system including:

a primary compressor;

a booster compressor;

a refrigerant conduit system, said primary compressor and said booster compressor being in series in said refrigerant conduit system;

a control panel, said control panel being connected between a multi-step thermostat and said primary and booster compressors, said control panel receiving signals from the multi-step thermostat and delivering power to operate only said primary compressor in a predetermined sequence in response to steps of the thermostat; and

at least one pressure sensor connected to said refrigerant conduit system for sensing refrigerant pressure at approximately the refrigerant low pressure side to generate signals to prevent or permit operation of said primary compressor as a function of outdoor ambient temperature.

23. (Original) A heat pump system as in claim 21 wherein;

said primary compressor is a multi-capacity compressor;

said multi-capacity compressor being operated at partial capacity in response to a first step signal from said thermostat; and

said multi-capacity compressor being operated at full capacity in response to a second step signal from said thermostat.

24. (Original) A method of operating a heat pump system in a cooling mode, said system having a primary compressor, a booster compressor, and a multi-step thermostat, including the steps of:

a) operating only said primary compressor;

b) sensing refrigerant pressure at approximately the refrigerant system low side pressure, said pressure being commensurate with outdoor ambient air temperature; and

c) preventing operation of said primary compressor when refrigerant system low side pressure falls to a predetermined point.

25. (Original) A method of operating a heat pump system in a cooling mode as in claim 24, wherein said primary compressor is a multi-capacity compressor, and including the steps of;

a) operating said primary compressor at partial capacity in response to a first step signal from said thermostat; and

b) operating said primary compressor at full capacity in response to a second step signal from said thermostat.

26. (Currently Amended) A defrost system for a heat pump, said heat pump having an outdoor coil, an indoor coil, at least one compressor, and a conduit system for circulating refrigerant to said compressor, said outdoor coil and said indoor coil, the defrost system including;

a) a bypass conduit for bypassing refrigerant around said indoor coil,

b) a heat exchanger in said bypass conduit;

c) a ~~water source~~ defrost energy transfer fluid supplied to said heat exchanger for imparting energy to said refrigerant in said heat exchanger;

d) said refrigerant being delivered from said heat exchanger to said compressor for compression and then to said outdoor coil.

27. (Original) A method of defrosting an outdoor coil in a heat pump system, the heat pump system having an outdoor coil, an indoor coil, at least one compressor, and a conduit system for circulating refrigerant to said compressor, said outdoor coil and said indoor coil, including the steps of;

a) bypassing refrigerant around said indoor coil;

b) delivering a defrost energy transfer fluid in heat exchange relationship with said bypassed refrigerant to impart energy to said bypassed refrigerant;

c) delivering the refrigerant from the heat exchanger to said at least one compressor;

d) compressing said refrigerant in said compressor; and

e) delivering said refrigerant from said compressor to said outdoor coil.

28. (Original) The method of defrosting as in claim 27 wherein, said defrost energy transfer fluid is water.

29. (Original) The method of defrosting as in claim 27 wherein, said defrost energy transfer fluid is antifreeze.

30. (New) A defrost system for a heat pump as in claim 26 wherein:

the defrost energy transfer fluid is water.

31. (New) A defrost system for a heat pump as in claim 26 wherein:

the defrost energy transfer fluid is antifreeze.